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# UTILITY PATENT APPLICATION TRANSMITTAL
## (Only for new nonprovisional applications under 37 CFR 1.53(b))

**Attorney Docket No.**   _005220.P001_                                          Total Pages  _5_

**First Named Inventor or Application Identifier**_ David D. Faraldo II _

**Express Mail Label No.** _ EL143569256US _

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**ADDRESS TO:**      **Assistant Commissioner for Patents**
**Box Patent Application**
**Washington, D. C. 20231**

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**APPLICATION ELEMENTS**
See MPEP chapter 600 concerning utility patent application contents.

1.  _X_     **Fee Transmittal Form**
(Submit an original, and a duplicate for fee processing)

2.  _X_     **Specification**   (Total Pages _35_ )
(preferred arrangement set forth below)
- Descriptive Title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claims
- Abstract of the Disclosure

3.  _X_     **Drawings(s) (35 USC 113)**   (Total Sheets _10_ )

4.  _X_     **Oath or Declaration**   (Total Pages _5_ )

   a.  _X_   Newly Executed (Original or Copy)

   b.  ___   Copy from a Prior Application (37 CFR 1.63(d))
   (for Continuation/Divisional with Box 17 completed) **(Note Box 5 below)**

   i.  ___   DELETIONS OF INVENTOR(S)  Signed statement attached deleting
   inventor(s) named in the prior application, see 37 CFR 1.63(d)(2)
   and 1.33(b).

5.  ___     Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or
declaration is supplied under Box 4b, is considered as being part of the
disclosure of the accompanying application and is hereby incorporated by
reference therein.

6.  ___     Microfiche Computer Program (Appendix)

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7. _____ Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
    a. \_\_\_\_ Computer Readable Copy
    b. \_\_\_\_ Paper Copy (identical to computer copy)
    c. \_\_\_\_ Statement verifying identity of above copies

## ACCOMPANYING APPLICATION PARTS

8. _____ Assignment Papers (cover sheet & documents(s))
9. _____ a. 37 CFR 3.73(b) Statement (where there is an assignee)

   _____ b. Power of Attorney

10. _____ English Translation Document (if applicable)
11. _X_ a. Information Disclosure Statement (IDS)/PTO-1449

   _X_ b. Copies of IDS Citations

12. _____ Preliminary Amendment
13. _X_ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
14. _____ a. Small Entity Statement(s)

       b. Statement filed in prior application, Status still proper and desired

15. _____ Certified Copy of Priority Document(s) (if foreign priority is claimed)

16. _X_ Other: _a copy of the postcard with Certificate of Express Mailing._

_____

_____

_____

17. **If a CONTINUING APPLICATION,** check appropriate box and supply the requisite information:

   \_\_\_ Continuation    \_\_\_ Divisional    \_\_\_ Continuation-in-part (CIP)

     of prior application No: _____

18. **Correspondence Address**

_____ Customer Number or Bar Code Label   _____

           or          (Insert Customer No. or Attach Bar Code Label here)

_X_ Correspondence Address Below

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# FEE TRANSMITTAL FOR FY 2001

## TOTAL AMOUNT OF PAYMENT ($)   1,168.00

**Complete if Known:**
**Application No.**      To be assigned
**Filing Date** __Herewith__
**First Named Inventor**      David D. Faraldo II
Group Art Unit __To be assigned__
Examiner Name __To be assigned__
Attorney Docket No. __005220.P001__

## METHOD OF PAYMENT (check one)

1.    [ X ]    **The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:**

   **Deposit Account Number**      02-2666
   **Deposit Account Name**

   [    ]    **Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17**

--------------------------------------------------------------------

2.    __X__    **Payment Enclosed:**
      __X__    **Check**
      _____    **Money Order**
      _____    **Other**

## FEE CALCULATION

### 1.    BASIC FILING FEE

| Large Entity | | Small Entity | | | |
|---|---|---|---|---|---|
| Fee Code | Fee ($) | Fee Code | Fee ($) | Fee Description | Fee Paid |
| 101 | 710 | 201 | 355 | Utility application filing fee | 710.00 |
| 106 | 320 | 206 | 160 | Design application filing fee | _____ |
| 107 | 490 | 207 | 245 | Plant filing fee | _____ |
| 108 | 710 | 208 | 355 | Reissue filing fee | _____ |
| 114 | 150 | 214 | 75 | Provisional application filing fee | _____ |

                                             **SUBTOTAL (1)  $ 710.00**

### 2.    EXTRA CLAIM FEES

| | | Extra Claims | Fee from below | | Fee Paid |
|---|---|---|---|---|---|
| Total Claims   41 | – 20** = | 21 | X | 18.00 = | 378.00 |
| Independent Claims 4 | – 3** = | 1 | X | 80.00 = | 80.00 |
| Multiple Dependent | | | | = | _____ |

**Or number previously paid, if greater; For Reissues, see below.

| Large Entity | | Small Entity | | |
|---|---|---|---|---|
| Fee Code | Fee ($) | Fee Code | Fee ($) | Fee Description |
| 103 | 18 | 203 | 9 | Claims in excess of 20 |
| 102 | 80 | 202 | 40 | Independent claims in excess of 3 |
| 104 | 270 | 204 | 135 | Multiple dependent claim, if not paid |
| 109 | 80 | 209 | 40 | **Reissue independent claims over original patent |
| 110 | 18 | 210 | 9 | **Reissue claims in excess of 20 and over original patent |

                                             **SUBTOTAL (2)  $ 458.00**

10/01/2000                                     - 1 -

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES

| Large Entity | | Small Entity | | | |
|---|---|---|---|---|---|
| Fee Code | Fee ($) | Fee Code | Fee ($) | Fee Description | Fee Paid |
| 105 | 130 | 205 | 65 | Surcharge - late filing fee or oath | _____ |
| 127 | 50 | 227 | 25 | Surcharge - late provisional filing fee or cover sheet | _____ |
| 139 | 130 | 139 | 130 | Non-English specification | _____ |
| 147 | 2,520 | 147 | 2,520 | For filing a request for reexamination | _____ |
| 112 | 920* | 112 | 920* | Requesting publication of SIR prior to Examiner action | _____ |
| 113 | 1,840* | 113 | 1,840* | Requesting publication of SIR after Examiner action | _____ |
| 115 | 110 | 215 | 55 | Extension for response within first month | _____ |
| 116 | 390 | 216 | 195 | Extension for response within second month | _____ |
| 117 | 890 | 217 | 445 | Extension for response within third month | _____ |
| 118 | 1,390 | 218 | 695 | Extension for response within fourth month | _____ |
| 128 | 1,890 | 228 | 945 | Extension for response within fifth month | _____ |
| 119 | 310 | 219 | 155 | Notice of Appeal | _____ |
| 120 | 310 | 220 | 155 | Filing a brief in support of an appeal | _____ |
| 121 | 270 | 221 | 135 | Request for oral hearing | _____ |
| 138 | 1,510 | 138 | 1,510 | Petition to institute a public use proceeding | _____ |
| 140 | 110 | 240 | 55 | Petition to revive unavoidably abandoned application | _____ |
| 141 | 1,240 | 241 | 620 | Petition to revive unintentionally abandoned application | _____ |
| 142 | 1,240 | 242 | 620 | Utility issue fee (or reissue) | _____ |
| 143 | 440 | 243 | 220 | Design issue fee | _____ |
| 144 | 600 | 244 | 300 | Plant issue fee | _____ |
| 122 | 130 | 122 | 130 | Petitions to the Commissioner | _____ |
| 123 | 50 | 123 | 50 | Petitions related to provisional applications | _____ |
| 126 | 240 | 126 | 240 | Submission of Information Disclosure Stmt | _____ |
| 581 | 40 | 581 | 40 | Recording each patent assignment per property (times number of properties) | _____ |
| 146 | 710 | 246 | 355 | For filing a submission after final rejection (see 37 CFR 1.129(a)) | _____ |
| 149 | 710 | 249 | 355 | For each additional invention to be examined (see 37 CFR 1.129(b)) | _____ |
| 179 | 710 | 279 | 355 | Request for Continued Examination (RCE) | _____ |
| 169 | 900 | 169 | 900 | Request for expedited examination of a design application | _____ |

Other fee (specify) _____ _____

Other fee (specify) _____ _____

**SUBTOTAL (3)   $ 0 _____**

*Reduced by Basic Filing Fee Paid

### SUBMITTED BY:

Typed or Printed Name: Daniel E. Ovanezian

Signature: _____   Date: 10/31/00

Reg. Number: 41,236   Telephone Number: 408-720-8300

# UNITED STATES PATENT APPLICATION

## FOR

## METHOD OF AND APPARATUS FOR REMOTE MONITORING

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Attorney Docket No.: 005220.P001

# METHOD OF AND APPARATUS FOR REMOTE MONITORING

## FIELD OF THE INVENTION

This invention relates to the field of network systems and, in particular, to remote monitoring of a computer system on a network.

5   ## BACKGROUND

The Internet may be described in a simplified manner as a collection of computer systems (e.g., clients and servers) that are interconnected by public/private networks (e.g., transmission lines and routers) to enable the transfer of information among them, as illustrated in Figure 1. These computer

10  systems are often modeled by their function: client-server. In the client-server model, communication generally takes the form of a request from the client to the server asking for an operation to be performed (e.g., request for data). The server performs the work and sends a reply. A client may then retrieve and display the requested information. However, a computer system may operate as

15  both a server and a client.

Client-server systems communicate with each other using a variety of network protocols, such as Transmission Control Protocol/Internet Protocol (TCP/IP) and Integrated Packet Exchange (IPX), and a variety of application protocols, such as HyperText Transfer Protocol (HTTP) and File Transfer

20  Protocol (FTP). A user typically views the Internet as a collection of web pages

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that are typically located on a server at a network site. Each web page may contain text, embedded components such as graphic image files, and address links to other pages referred to as a Uniform Resource Locator (URL). Web pages are viewed using a program called a browser that resides on a user's client

5      computer. The browser retrieves information from a requested page on a server, interprets the data and formatting commands, and displays the text and special accessory files, such as images, on the user's client system.

Increased traffic on the Internet has resulted in performance problems with sites (systems and connections), such as reduced download speeds during

10     periods of heavy loads (a measure of system activity). Businesses are faced with the increasing burden of monitoring and testing the performance of their sites on a real-time basis. For example, a business may rely on its on-line site to sell a product. If the business site, or a portion thereof (e.g., a web page or server), is not operating properly, orders for a product may not be able to be placed. This

15     may result in a business suffering financial consequences. As such, a business has an interest to know if and when any portion of its site ceases to operate properly from its customer's point of view.

The performance of a site and its computer systems may be measured in different ways. One measure of performance is the accessibility of the computer

20     system through a backbone used to connect the computer system with an end user. A backbone, also referred to as an Autonomous System (AS) network, is a

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set of transmission lines and hardware that a business site may be connected to for long distance communication. Another measure of performance is the amount of time it takes to retrieve and display the information to the user, referred to as download speed.

5      One way to monitor and analyze a business site's performance is to measure performance on the server side (the computer system providing the pages requested by the user). One problem with such a method is that the performance experienced by a user may not be readily determined from measurements made from the server. For example, the speed with which a

10     server delivers requested information may not correlate with the speed experienced on the client side by a user due to, for example, congested or downed transmission lines.

Another way to monitor and analyze a site's performance is to perform client side measurements using an actual user's client system. For example, a

15     user's client browser may be configured to record download speeds of particular transactions. Such performance information is stored on a client's system and then obtained from the user's system. One problem with such a method is that the performance information collected is based on user specific factors that may be uncontrollable and may not be common to other users. For example, a user

20     running several simultaneous, high bandwidth downloads will typically

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experience slower performance than a user on an identical client system with an identical browser who is running a single low bandwidth download.

Another problem with client side measurements is that the collected performance information may be limited to only measuring the total load time of a web page and throughput (bytes of data sent over an end-to-end transaction time). The condition of the network connection to the client may not be included in the collected information. As such, allowances for these other factors may not be made when analyzing performance.

Moreover, strictly load time and throughput measurements do not reflect the quality of the downloaded information. For example, if a server is non-operational, then requests to a web page on the server may return an error message response (e.g., "can't process request") very quickly. This would appear to be a period of exceptionally good download performance when, in fact, no content from the site was downloaded to the user. Therefore, such a method may not provide an accurate or detailed analysis of a site's performance that reflects a customer's true experience.

Furthermore, prior methods of web site analysis use browsers that are very code intensive and operating systems that may not be very reliable. Such platforms may not be very scalable or robust and, thus, may not be desirable.

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## SUMMARY OF THE INVENTION

The present invention pertains to a method of and apparatus for remote monitoring. In one embodiment, the apparatus may includes an intranetwork, an extranetwork coupled to the intranetwork, and a first host digital processing

5    system coupled to the intranetwork with the first digital processing system has performance parameters. The first remote digital processing system may be coupled to the extranetwork to monitor a performance parameter of the first host digital processing system.

In one embodiment, the method may include positioning a remote digital

10    processing system on a backbone network remotely from a host digital processing system with the host digital system coupled to the backbone network through an intranetwork. The method may also include monitoring a performance parameter of the host digital processing system with the remote digital processing system.

15    Additional features and advantages of the present invention will be apparent from the accompanying drawings and from the detailed description that follows.

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## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which:

Figure 1 illustrates an internetwork architecture.

Figure 2 illustrates one embodiment of a network site monitoring system.

Figure 3 illustrates one embodiment of remote satellite systems coupled to an IP network.

Figure 4 is a block diagram illustrating an exemplary architecture of a remote satellite monitoring system.

Figure 5 illustrates one embodiment of a remote satellite system in the form of a digital processing system.

Figure 6 illustrates an alternative embodiment of a network site monitoring system.

Figure 7A illustrates one embodiment of a method of remote monitoring.

Figure 7B illustrates one embodiment of a configuration interface.

Figure 8 illustrates one embodiment of a timing parameters measurement process.

Figure 9 illustrates one embodiment of a parameters correctness verification process.

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DETAILED DESCRIPTION

In the following description, numerous specific details are set forth such as examples of specific systems, languages, components, etc. in order to provide a thorough understanding of the present invention. It will be apparent,

5      however, to one skilled in the art that these specific details need not be employed to practice the present invention. In other instances, well known materials or methods have not been described in detail in order to avoid unnecessarily obscuring the present invention.

The present invention includes various steps, which will be described

10     below. The steps of the present invention may be performed by hardware components or may be embodied in machine-executable instructions, which may be used to cause a general-purpose or special-purpose processor programmed with the instructions to perform the steps. Alternatively, the steps may be performed by a combination of hardware and software.

15     The present invention may be provided as a computer program product, or software, that may include a machine-readable medium having stored thereon instructions, which may be used to program a computer system (or other electronic devices) to perform a process according to the present invention. The machine-readable medium may include, but is not limited to, floppy diskettes,

20     optical disks, CD-ROMs, and magneto-optical disks, ROMs, RAMs, EPROMs,

EEPROMs, magnet or optical cards, flash memory, or other type of media / machine-readable medium suitable for storing electronic instructions.

Figure 2 illustrates one embodiment of a network site monitoring system. The network monitoring system 200 may include various hardware and software

5   components to perform monitoring functions. The network monitoring system 200 may include a business site 210, one or more remote satellite systems (e.g., remote satellite system 250) located remotely from business site 210, and a monitoring operations center (MOC) 230. Business site 210, remote satellite system 250 and MOC 230 may be coupled together via extranetwork 220, such as

10   an Internet Protocol (IP) network.

An IP network transmits data in the form of packets that include an address specifying the destination systems for which communication is intended. Business site 210, remote satellite system 250, and MOC 230 may communicate with each other using various protocols, for examples, HTTP, Telnet, NNTP, and

15   FTP. Security layers for managing the security of data transmission may also reside between the application protocols and the lower protocol (TCP/IP) layers, for examples: Secure Sockets Layers (SSL). Alternatively, secure application protocols may be used, for examples, Secure HTTP (HTTPS) and Secure Shell (SSH). These various protocols are known in the art; accordingly, a detailed

20   discussion is not provided herein.

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In one embodiment, MOC 230 may be located remotely from business site

210. Alternatively, MOC 230 may be located locally to or within business site

210. It should be noted that local and remote designations do not necessarily

refer to geographic relationships but, rather, to network relationships.

5        Business site 210 may include one or more computer systems, or hosts,

(e.g., hosts 211-213) connected together via intranetwork 215. Three hosts 211-

213 are shown only for illustrative purposes. Business site 210 may have more or

less than three hosts. Hosts 211-213 may be configured to perform as servers. In

one embodiment, intranetwork 215 is a local area network (LAN). The local area

10     network may be either a wired or wireless network. Alternatively, hosts 211-213

may be coupled together using other types of networks, for example, a

metropolitan areas network (MAN) or a wide area network (WAN) with various

topologies and transmission mediums.

        A host (e.g., host 211) may be configured to provide various services for

15     clients that are accessed through ports of the host connected to intranetwork 215.

Types of network services include, for examples, electronic mail using a Simple

Mail Transfer Protocol (SMTP), web page display using HTTP, news article

distribution using a Network News Transfer Protocol (NNTP), fetching email

from a remote mailbox using a Post Office Protocol-3 (POP3), and text file

20     retrieval for viewer displaying using Gopher, etc. Each service may be

configured on an industry standard port or on a custom port. If a service

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operates with a custom port, then remote satellite system 250 may either be preprogrammed with the port information or perform probes to determine a port's configuration.

For example, if host 211 is configured to operate as an HTTP server,

5    remote satellite system 250 may attempt to establish a connection to industry standard TCP port 80 (or port 443 if HTTPS is used) to determine if it is connected to intranetwork 215. If no reply is received, then port 80 for that particular host 211 is either down or host 211 may be using a different port for the service.

10    Figure 3 illustrates one embodiment of remote satellite systems coupled to an IP network. In one embodiment, one or more remote satellite systems (e.g., remote satellite systems 351-353) may be strategically positioned at different points on IP network 320 that are close to network backbones 321-324. Four network backbones are shown only for illustrative purposes. The network site

15    monitoring system may include more or less than four backbones. Backbones are extranetworks that enable high-bandwidth communication, in particular long distance communication, between short range networks (e.g., local and regional area networks). Examples of backbones 321-324 include those provided by Sprint, AT&T, Exodus, and UUNET.

20    Remote satellite systems 351-353 are positioned at points similar to those of expected users (e.g, user 340) of business site 310. In one embodiment, remote

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satellite systems 351-353 may be positioned behind peering points between

backbones. In another embodiment, remote satellite systems 351-353 may be

positioned at geographically significant locations (e.g., countries, states, and

cities from which users access network 320) or network-topographically

5    significant locations (e.g., close to and far from business site's 310 server). Other

strategies may be used to position remote satellite systems 351-353. For example,

in another embodiment, remote satellite systems 351-353 may be positioned

behind major Internet Service Provider (ISP) proxy servers or behind access

points for the business users (e.g., large dial-up pools such as America On Line

10    and Earthlink, cable ISP providers, DSL providers, ISDN providers, etc.)

Remote satellite systems 351-353 may operate similar to a client system to

interact with hosts of business site 310 in order to monitor and evaluate user

interactions with the business site 310 hosts (i.e., the experience that a user of the

business site will undergo). It should be noted that the remote satellite systems

15    351-353 are not limited to directly accessing a host but may also access a host

through another system such as a proxy server.

Business site 310 may designate the URLs of one or more web pages to

monitor and evaluate. In one embodiment, a business site may be able to pre-set

cookies in the monitoring configuration to allow remote satellites 351-353 to

20    access particular web pages. In general, a business site may serve information

both in a stateless way (e.g., the corporate info page, a static page that is served

up the same way to every visitor on each visit) and in a stateful way (e.g., a

user's account info page, where the information may change between users and

between each visit of the same user, and where the system must first know some

state before serving up information, particularly some user-identifying state

5    information like a username).

In one embodiment, to get the stateful information, a user usually goes

through a fixed flow. For example, to get to an "Account Information" page, a

user may first have to go through a "Login" page, then to a "Select Account"

page. At each stage, the server must know where the user is in the process. That

10   information may be maintained with cookies that are small portions of data

stored on the client machine that are sent tot the server with information

requests. Typically an unattended agent exercises this flow. The agent runs a

monitoring script that posts authentication data, accepts the cookie, posts the

account number, and then examines the final page. However, if the "Login"

15   page is down, the other two pages may not be monitored. As such, by pre-

setting a cookie with required state information, an unattended agent may verify

the performance of each page independent of the other pages.

Referring still to Figure 3, a web page may be configured to perform a

particular type of transaction, for example, a purchase transaction. These URL

20   addresses may be downloaded to remote satellite systems 351-353 or

programmed directly into remote satellite systems 351-353. The remote satellite

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systems 351-353 establish connections with the designated URL to perform

transactions and report on the various system parameters and backbone

conditions such as transaction times (e.g., connection time, download times, etc.)

as discussed below. Because remote satellite systems 351-353 are connected to

5    backbones 321-324 at points similar to that of a business site's 310 users (e.g., user

340), remote satellite systems 351-353 may provide data relevant to the

experience that similarly connected users experience. The remote satellite

systems 351-353 collect this data for analysis and report generation.

In one embodiment, the data is analyzed and a report is generated by the

10   remote satellite systems 351-353 and transmitted to MOC 330, with the data also

being transmitted if desired. Alternatively, the data may be transmitted to MOC

330 with the analysis and report being generated at MOC 330. The information

on remote satellite systems 351-353 may either be pushed or pulled across IP

network 320 to MOC 330 for processing such as evaluation, notification, and

15   reporting. The MOC 330 may then take corrective actions including notifying

the business site of identified problems; rerouting network traffic; and/or

contacting a backbone provider directly to fix problems. For example, if the

access time monitored by remote satellite system 353 on backbone 322 is long

relative to the time on backbones 321, 323, and 324, then traffic may be rerouted

20   to the other backbones until the data collected by remote satellite system 353

indicates that the problem has been fixed.

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Figure 4 is a block diagram illustrating an exemplary architecture of a remote satellite monitoring system. In one embodiment, remote satellite monitoring system 400 may include a configuration file or database 410 for storing parameters for the different business sites that are monitored. The

5    parameters provide a remote satellite system with the information needed to monitor a host, for examples, URLs to monitor, thresholds to alert on, authentication information for password-protected pages, data to upload, pre-defined cookies, and positive/negative search patterns, as discussed below.

In one embodiment, the information stored in configuration file 410 is

10   provided to configuration file reader 420 that reads the information from configuration file 410 and provides it to monitoring agent 425. In an alternative embodiment, monitoring agent 425 may read the configuration database directly.

Once monitoring agent 425 has the configuration information, one or more of the following operations may be performed for each configured

15   transaction. In one embodiment, timing analyzer 440 may be used to measure timing threshold parameters. Timing threshold parameters may include, for examples, domain name system (DNS) lookup time, connect time, latency, transfer rate, and throughput. Timing generator 430 is used to generate the timing signals required to measure the timing threshold parameters.

20       In the addressing scheme of an IP network, an address comprises four number strings separated by dots. Each computer system on the network has a

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unique address. For ease of use, names in the form of alphanumeric characters

(e.g., recognizable words) may be mapped to a number string. The DNS is a

hierarchical naming scheme and distributed database system for implementing a

naming scheme for mapping computer system names to IP addresses. The DNS

5    lookup time is the time it takes for a client system's browser (in this case the

remote satellite system) to connect with a DNS database to translate the business

site web page server's name (e.g., www.nocpulse.com) into an IP address, before

sending a request to the business site server. As such, connection agent 425 is

used to establish a connection with a DNS database for a designated URL and

10    then, subsequently, establish a connection with the designated URL.

Once a connection with a particular URL is established, timing analyzer

440 is used to record detailed timing statistics of a transaction. During the

transaction, the connect time, latency, transfer rate, and throughput parameters

may be measured. The connect time is the time it takes for a client system to

15    send a request to establish a connection with a business server and receive a

reply from the business server that a connection is established.

Additional timing parameters such as latency may also be measured.

Latency is the time between a client sending in a request for data and getting

back the first byte of data. For example, for a credit card transaction, a user

20    sends in data about his credit card (e.g., account name, credit card number,

expiration date, etc.) and the items that he wishes to purchase to the business

site. The business site may then contact the credit card company, where some back-end processing is performed, to verify the user's credit. Only after this is complete will the business site transmit a confirmation to the user that the purchase transaction is complete. In this example, the request for data may be

5    the request for acknowledgement of a completed transaction and the data sent back to the user is confirmation that the transaction has been successfully completed. As such, the transaction generator 440 performs steps similar to those that a user would perform to complete a desired transaction (e.g., a credit card transaction).

10        The transfer rate is the network rate, or the bytes per second between the first byte and last byte of a particular response. Throughput is the time it takes (e.g., in bytes per second) for an entire session from DNS lookup to the last byte received by a client.

            The remote satellite system may also evaluate correctness parameters of

15   the network connection to the business site using verifier 450. Verifier 450 may be part of a host program, a separate program on a remote satellite system, or a separate program on another system. Verifier 450 may include one or more verifiers to evaluate correctness parameters. For example, verifier 450 may include a content verifier, a subsidiary page (SUBS) verifier, and link verifier.

20        The content verifier verifies the data according to the configuration, for examples, the size of the content, the format (HTML vs. XML vs. GIF, etc.), and

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whether the content contains the correct information. Verifying the correctness

of content may be performed by determining positive or negative search patterns

on a particular web page. Search patterns may be literal strings such as ordered

groups of characters (e.g., partial words, words, and phrases with or without

5    spacing and punctuation) or regular expressions such as patterns of characters

(e.g., one or more digits followed by a pound sign). Positive search patterns are

patterns that must be found in the content for the content to be considered

correct. Negative search patterns are patterns that must not be found in the

content for the content to be considered correct.

10    In one embodiment, the content may be passed off to a SUBS verifier

which parses the content for subsidiary pages and tries to retrieve each

subsidiary page. A subsidiary page contains data that is attached to a parent

web page. As previously discussed, a web page may contain links to special

accessory files (e.g., images, frames, background sounds, applets, etc.) that are

15    automatically loaded by a client's browser in addition to the text. When a

client's browser loads a web page that contains an image, for example, at least

two transactions may be performed: an HTML transaction that loads the text of

the web page and fetch transaction that retrieves the image file from its storage

location. As such, evaluating the correctness of such a subsidiary page involves

20    determining whether the content of the subsidiary page is available for retrieval.

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In one embodiment, the content may be passed off to a links verifier. A web page may also contain links (i.e., strings of text containing IP addresses of other web pages) that a user can access by, for example, selecting the link with a cursor control device. The links verifier parses the content for links (e.g., HTML

5   Anchor tags and hypertexts links) and makes a determination as to whether the content on a link is accessible.

The output of verifier 450 is provided to queuing client 485 to store and queue collected data such as performance metrics (e.g., timing parameter statistics and correctness parameter checks) and alerts. Queuing client 485 may

10  periodically transmit the collected data to results database 470 and/or a notification system such as MOC 230 of Figure 2. The remote satellite monitoring system 400 may also include multiple queues for different types of data, for example, one queue for correctness parameters and one for timing parameters. A priority may be set for each of the queuing clients that

15  determines the order in which data will be uploaded.

The performance metrics may be provided to results database 470 either directly via queuing client 460 or by way of another interface where they are made available to report generator 460. Report generator 460 generates a report file 480 that contains information about the performance metrics. Reports

20  generator 460 may generate reports automatically or on demand. A report may be, for example, a graph of the connect time over the previous three hours. In an

alternative embodiment, the data collected by remote monitoring system 400 may be transmitted to a MOC, with the MOC performing report generation.

It should be noted that although the monitoring and evaluating of a business site has been discussed at times in relation to an HTML protocol,

5   systems operating with other types of protocols, for examples, FTP and Gopher may also be monitored and evaluated.

Figure 5 illustrates one embodiment of a remote satellite system in the form of a digital processing system 500 representing an exemplary workstation, personal computer, server, etc., in which features of the present invention may

10  be implemented.

Digital processing system 500 includes a bus or other communication means 501 for communicating information, and a processing means such as processor 502 coupled with bus 501 for processing information. Processor 502 may represent one or more processors such as a Motorola PowerPC processor or

15  an Intel Pentium processor, etc. Digital processing system 500 further includes system memory 504 that may include a random access memory (RAM), or other dynamic storage device, coupled to bus 501 for storing information and instructions to be executed by processor 502. System memory 504 also may be used for storing temporary variables or other intermediate information during

20  execution of instructions by processor 502. System memory 504 may also include

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a read only memory (ROM) and/or other static storage device coupled to bus 501 for storing static information and instructions for processor 502.

A data storage device 507 such as a magnetic disk or optical disc and its corresponding drive may also be coupled to digital processing system 500 for storing information and instructions. The data storage device 507 may be used to store instructions for performing the steps discussed herein. Processor 502 may be configured to execute the instructions for performing the steps discussed herein. In one embodiment, digital processing system 500 is configured to operate with a LINUX operating system stored on data storage device 507. In alternative embodiments, another operating system may be used, for examples, Windows NT and Solaris.

In one embodiment, digital processing system 500 may also be coupled via bus 501 to a display device 521, such as a cathode ray tube (CRT) or Liquid Crystal Display (LCD), for displaying information to the user. For example, graphical and/or textual depictions/indications of system performance characteristics, and other data types and information may be presented to the system administrator on the display device 521. Typically, an alphanumeric input device 522, including alphanumeric and other keys, may be coupled to bus 501 for communicating information and/or command selections to processor 502. Another type of user input device is cursor control 523, such as a mouse, a trackball, or cursor direction keys for communicating direction information and

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command selections to processor 502 and for controlling cursor movement on display 521.

A network interface device 525 is also coupled to bus 501. Depending upon the particular design environment implementation, the network interface

5    device 525 may be an Ethernet card, token ring card, or other types of interfaces for providing a communication link to a backbone of an IP network for which digital processing system 500 is monitoring.

It will be appreciated that the digital processing system 500 represents only one example of a system, which may have many different configurations

10   and architectures, and which may be employed with the present invention. For example, some systems often have multiple buses, such as a peripheral bus, a dedicated cache bus, etc.

In one embodiment, communication device 526 may also be coupled to bus 501. The communication device 526 may be a modem, or other well-known

15   interface device, for providing a communication link to the MOC independent of the communication link to which network interface 525 is connected. In this manner, communication device 526 provides a backup link to a MOC if the primary link fails as illustrated by Figure 6. For example, remote satellite system 650 may include a modem to enable communication via the Public Switched

20   Telephone Network (PSTN) 625 with MOC 630 independent of the communication link through IP network 620. In an alternative embodiment,

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other communication means (e.g., wireless) may be used to enable remote

satellite system 650 communication with MOC 630 independent of IP network

620. MOC 630 may include one or more digital processing systems similar to

digital processing system 500 of Figure 5.

5          Figure 7A illustrates one embodiment of a method of remote monitoring.

The method may include determining parameters to monitor, step 710. In one

embodiment, the parameters may be configured by the business site through a

configuration interface at the MOC and then downloaded by the MOC to one or

more of the remote satellite systems. Alternatively, the configuration interface

10    may reside at a remote satellite system.

Figure 7B illustrates one embodiment of a configuration interface 760. The

parameters may include for examples, the URL (the location of the desired

information, including protocol, server, port, path, and optionally additional

data) 761, authentication information 762, timing thresholds 763, notification

15    configuration 764, features (e.g., check links) 765, pre-set cookie 767. In an

alternative embodiment, these parameters may be supplied by a business site

through other means and configured by the MOC, or determined by the MOC as

discussed above.

Referring again to Figure 7A, a connection with a particular host (e.g., a

20    URL address) is attempted, step 720, so that a transaction may be performed,

step 725. In one embodiment, one or more timing parameters are measured, step

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730. In an alternative embodiment, one or more correctness parameters may be evaluated, step 740. A determination is made if there are additional tansactions, step 755, and additional URLs are to be analyzed, step 750. If so, then steps 720-740 may be repeated. Once one or more URLs are analyzed, the collected

5    parameter data is analyzed and the data is uploaded, step 760.

Figure 8 illustrates one embodiment of a timing parameter measurement process. In one embodiment, a high resolution timer is started, step 810. Next, a DNS lookup may be performed and the lookup time calculated, step 815. After DNS lookup is complete, a connection with a particular URL address of a host

10    system is established and the connect time calculated, step 820. Time may be calculated with either direct or relative timing measurements.

The transaction request may be performed and the time of request recorded, step 825. Receipt of the first byte of the response is waited for and the latency calculated, step 830. When the last byte of data is received, the total time

15    is recorded, step 835. The calculation of aggregate timing parameters may be performed, step 840, including data transfer rate and throughput.

Figure 9 illustrates one embodiment of a parameters correctness verification process. In one embodiment, the parameter correctness verification process may include one or more of the following: verification of search strings

20    910; verification of SUBS 930; and verification of links 950.

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Content verification 910 may include selecting a positive search pattern or a negative search pattern, step 915; searching the content, step 920; and comparing the pattern with the searched content, step 925. In one embodiment, search patterns may be simple strings (i.e., ordered groups of characters), and

5    step 925 may include determining if the search string occurs anywhere in the content. In another embodiment, search patterns may be regular expressions (e.g., three digits followed by a pound sign) and step 925 may include determining if any group of characters in the content satisfy the expression. The content is successfully verified if the pattern is a positive pattern and the pattern

10    matches, or the pattern is a negative pattern and the pattern does not match. If there is additional content to be verified, step 926, the process may be repeated.

Verification of SUBS 930 may include determining the existence of accessory files, step 935. The accessory files are fetched, step 940, and then examined to determine if the content of these files is available, step 945. For

15    example, a web page may contain a link to an image file that is automatically loaded by a client's browser in addition to the text. As such, a fetch transaction may be performed to retrieves the image file from its storage location. If no image is retrieved then a determination may be made the content of the image file is not available for retrieval. The process may be recursive. For example, if

20    page A contains subsidiary page B, and subsidiary page B contains its own subsidiary page C, then both B and C (and sub-subsidiary pages) are verified. If

there are additional subsidiary pages to be verified, step 946, the process may be repeated.

Verification of links 950 may include determining the existence of a link, step 955, and following the link, step 960. Next, a determination may be made as to whether the link is accessible, step 965. In one embodiment, accessibility may include downloading the linked data and possibly doing one or more content checks (e.g., verify that the returned page is not empty). In another embodiment, following the link may include query the linked server to see if the linked data is available, but without actually downloading the data. Either embodiment, may be implemented by the link verifier directly, or the link verifier may drive an external program (e.g., monitoring client 431 of Figure 4). The process may be repeated for additional links, step 967.

In one embodiment, the method and architecture discussed above may be implemented with an interpreter program. An interpreter is a language processor that analyzes a program and then carries out the specified actions (processes instructions) at the time of execution, rather than producing a machine-code translation to be executed later (as with a compiler). In one embodiment, the steps discussed above are coded using Perl. In an alternative embodiment, other programming languages may be used.

The method and apparatus for remote monitoring of a business site as described above may provide valuable information about the business site. By

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positioning the remote satellite systems at points near backbones approximate to those of clients accessing a business site, a more accurate analysis of a site's performance may be performed that better reflects an end user's true experience. In addition, by using dedicated remote satellite systems, consistent information

5      about the performance of a business site may be collected independent of variations in an end user's client system hardware and software. Moreover, by measuring various timing threshold parameters and evaluating correctness parameters of the network connection to the customer site, a more detailed analysis of a site's performance may be performed.

10      In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will, however, be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention as set forth in the appended claims. The specification and drawings are, accordingly, to be

15      regarded in an illustrative rather than a restrictive sense.

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CLAIMS

What is claimed is:

1    1.     A system, comprising:

2        an intranetwork;

3        an extranetwork coupled to the intranetwork;

4        a first host digital processing system coupled to the intranetwork,

5    the first digital processing system having performance parameters; and

6        a first remote digital processing system coupled to the

7    extranetwork to monitor a performance parameter, the first remote digital

8    processing system coupled to the extranetwork at a first location similar to

9    that of a first expected user of the first host digital processing system.

1    2.     The system of claim 1, wherein the extranetwork comprises a first

2    backbone network and wherein the first remote digital processing system

3    is coupled to the first backbone network.

1    3.     The system of claim 2, further comprising a second remote digital

2    processing system to monitor a performance parameter of the first host

3    digital processing system, wherein the extranetwork further comprises a

4    second backbone network and wherein the second remote digital

5    processing system is coupled to the second backbone network at a second

6    location similar to that of a second expected user of the second host digital

7    processing system.

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1     4.     The system of claim 2, further comprising a monitoring operations

2     center coupled to the extranetwork, the monitoring operations center to

3     receive data from the first remote digital processing system.

1     5.     The system of claim 4, wherein the data includes the performance

2     parameter.

1     6.     The system of claim 5, further comprising a second extranetwork

2     coupled to the first remote digital processing system and the monitoring

3     operations center, the second extranetwork to transmit the data from the

4     first remote digital processing system to the monitoring operations center.

1     7.     The system of claim 6, wherein the second extranetwork is a public

2     switched telephone network.

1     8.     The system of claim 6, wherein the second extranetwork is a

2     wireless network.

1     9.     The system of claim 1, wherein the first remote digital processing

2     system is configured to pre-set cookies on the host digital processing

3     system.

1     10.     The system of claim 9, wherein the host digital processing system

2     includes a plurality of web pages and wherein the pre-set cookies enable

3     the first remote digital processing system to access a particular one of the

4     plurality of web pages independent of another of the plurality of web

5     pages.

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1        11.    The system of claim 1, wherein the performance parameter is a

2        timing threshold parameter.

1        12.    The system of claim 11, wherein the timing threshold parameter is

2        a domain name system lookup time.

1        13.    The system of claim 11, wherein the timing threshold parameter is

2        a connect time.

1        14.    The system of claim 11, wherein the timing threshold parameter is

2        throughput.

1        15.    The system of claim 11, wherein the timing threshold parameter is

2        a transfer rate.

1        16.    The system of claim 11, wherein the timing threshold parameter is

2        latency.

1        17.    The system of claim 1, wherein the performance parameter is a link

2        verification.

1        18.    The system of claim 1, wherein the performance parameter is a

2        subsidiary page verification.

1        19.    The system of claim 4, wherein the first remote digital processing

2        system includes a queuing client to control the transfer of data to the

3        monitoring operations center.

1        20.    A method of network monitoring, comprising:

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2     positioning a remote digital processing system on a backbone

3  network remotely from a host digital processing system, the remote

4  digital processing system position approximate that of an expected user of

5  the host digital processing system, the host digital system coupled to the

6  backbone network through an intranetwork; and

7     monitoring a performance parameter of the host digital processing

8  system with the remote digital processing system.

1  21.  The method of claim 20, further comprising transmitting

2  information about the performance parameter to a monitoring operations

3  center.

1  22.  A method of claim 20, wherein monitoring comprises:

2     determining the performance parameter for monitoring;

3     establishing a connection with the host digital processing system;

4  and

5     performing a transaction with the host digital processing system.

1  23.  The method of claim 22, wherein determining comprises receiving

2  the performance parameter through a configuration interface.

1  24.  The method of claim 22, wherein establishing comprises pre-setting

2  cookies on the host digital processing system to enable the remote digital

3  processing system to access data on the host digital processing system.

1  25.  The method of claim 22, wherein the performance parameter is a

2  timing parameter associated with the transaction and wherein the method

3  further comprises measuring the timing parameter.

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1     26.    The method of claim 22, wherein the performance parameter is a

2    domain name server lookup time associated with establishing the

3    connection.

1     27.    The method of claim 25, wherein measuring comprises calculating

2    a latency time.

1     28.    The method of claim 25, wherein measuring comprises calculating

2    a throughput time.

1     29.    The method of claim 25, wherein measuring comprises calculating

2    a connection time.

1     30.    The method of claim 25, wherein measuring comprises calculating

2    a data transfer rate.

1     31.    The method of claim 22, wherein the performance parameter is a

2    correctness parameter and wherein the method further comprises

3    evaluating the correctness parameter.

1     32.    The method of claim 31, wherein evaluating comprises:

2          determining a positive search pattern;

3          determining a negative search pattern; and

4          comparing the positive search pattern with the negative search

5    pattern to verify the correctness of a content.

1     33.    The method of claim 31, wherein evaluating comprises:

2          fetching an accessory file from a storage location; and

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3                verifying that content of the accessory file is available for retrieval.

1    34.     The method of claim 31, wherein evaluating comprises:

2          selecting a link on a web page; and

3          verifying that content corresponding to the web page is accessible.

1    35.     A method, comprising:

2          monitoring performance parameters of a host digital processing

3 system coupled to an extranetwork using a plurality of remote digital

4 processing systems, the extranetwork comprising a plurality of backbone

5 networks, at least one of the plurality of remote digital processing systems

6 selectively coupled to at least one of the plurality of backbone networks at

7 a position approximate that of an expected user of the host digital

8 processing system.

1    36.     The method of claim 35, wherein monitoring comprises:

2          evaluating the performance parameters using one of the plurality

3 of remote digital processing systems; and

4          transmitting a report on the evaluating from the one of the

5 plurality of remote digital processing systems to another of the plurality

6 of remote digital processing systems.

1    37.     The method of claim 36, wherein evaluating the performance

2 parameters includes measuring a timing threshold associated with an

3 interaction with the host digital processing system.

1    38.     An apparatus, comprising:

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2      means for positioning a remote digital processing system on a

3   backbone network remotely from a host digital processing system, the

4   remote digital processing system position approximate that of an expected

5   user of the host digital processing system, the host digital system coupled

6   to the backbone network through an intranetwork; and

7      means for monitoring a performance parameter of the host digital

8   processing system with the remote digital processing system.

1   39.    The apparatus of claim 38, wherein the means for monitoring

2   comprises:

3      means for evaluating the performance parameter; and

4      means for reporting the evaluation of the performance parameter

5   to a monitoring operations center.

1   40.    The apparatus of claim 39, wherein the performance parameter is a

2   timing threshold.

1   41.    The apparatus of claim 39, wherein the performance parameter is a

2   correctness parameter.

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## ABSTRACT

A method and apparatus is described for remote monitoring of a business site network. One or more remote satellite systems may be strategically positioned at different points on the Internet that are close to backbone networks

5   in order to monitor and evaluate typical user interactions with a business site. By positioning the remote satellite systems at points near backbones approximate to those of users accessing a business site, a more accurate analysis of a site's performance may be performed that better reflects the experience that similarly connected users experience. Various network and system parameters of a

10   business site may be monitored, such as threshold timing parameters and correctness parameters.
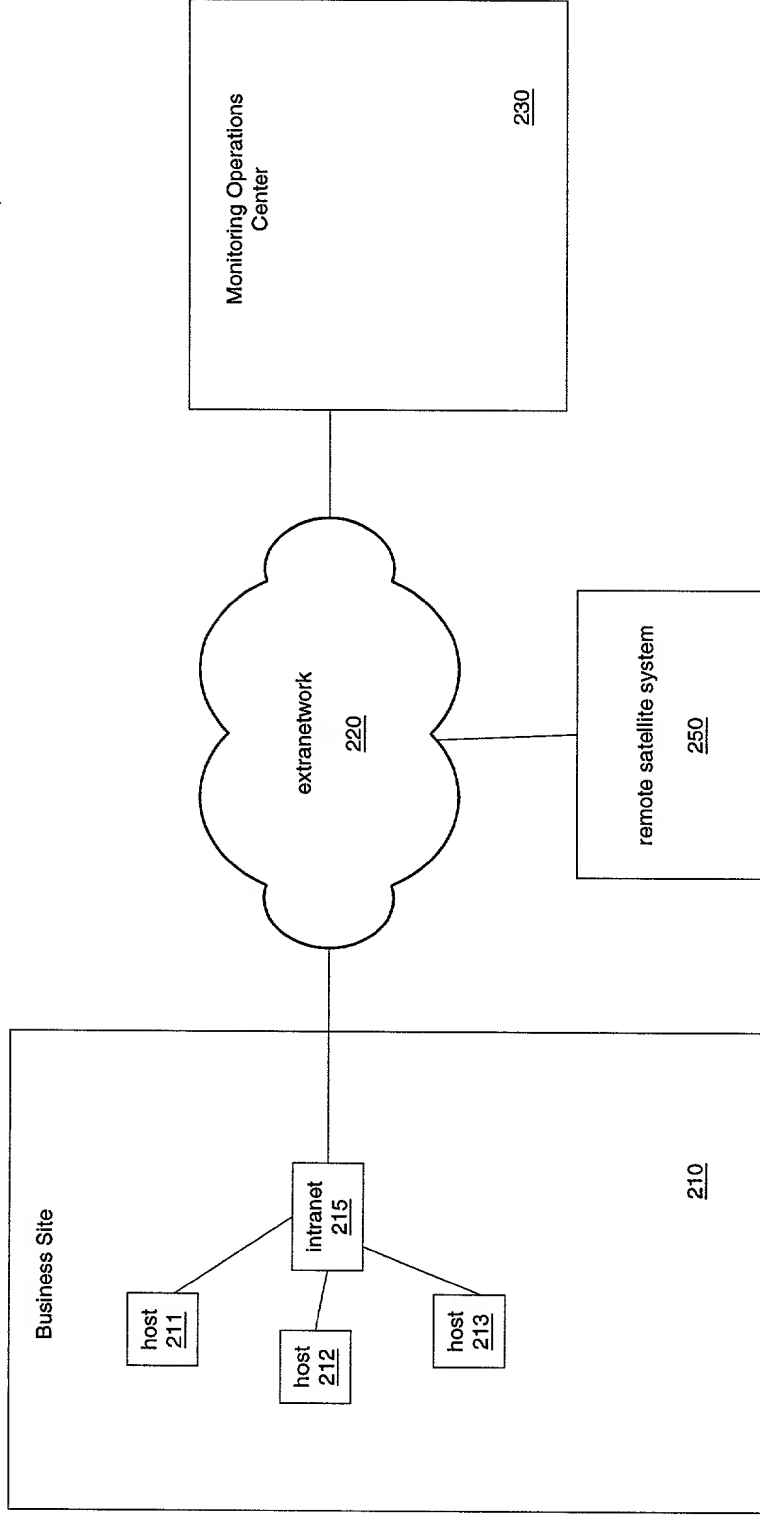
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Figure 1

200

Business Site

host 211

host 212

host 213

intranet 215

210

extranetwork 220

remote satellite system 250

Monitoring Operations Center

230

Figure 2

MOC
330

Remote
Satellite
System — 353

320

Backbone
322

Backbone
321

IP network

Backbone
324

Backbone
323

Remote
Satellite
System — 352

User
340

Remote
Satellite
System — 351

Business
Site
310

Backbone

321
322
323

324 N
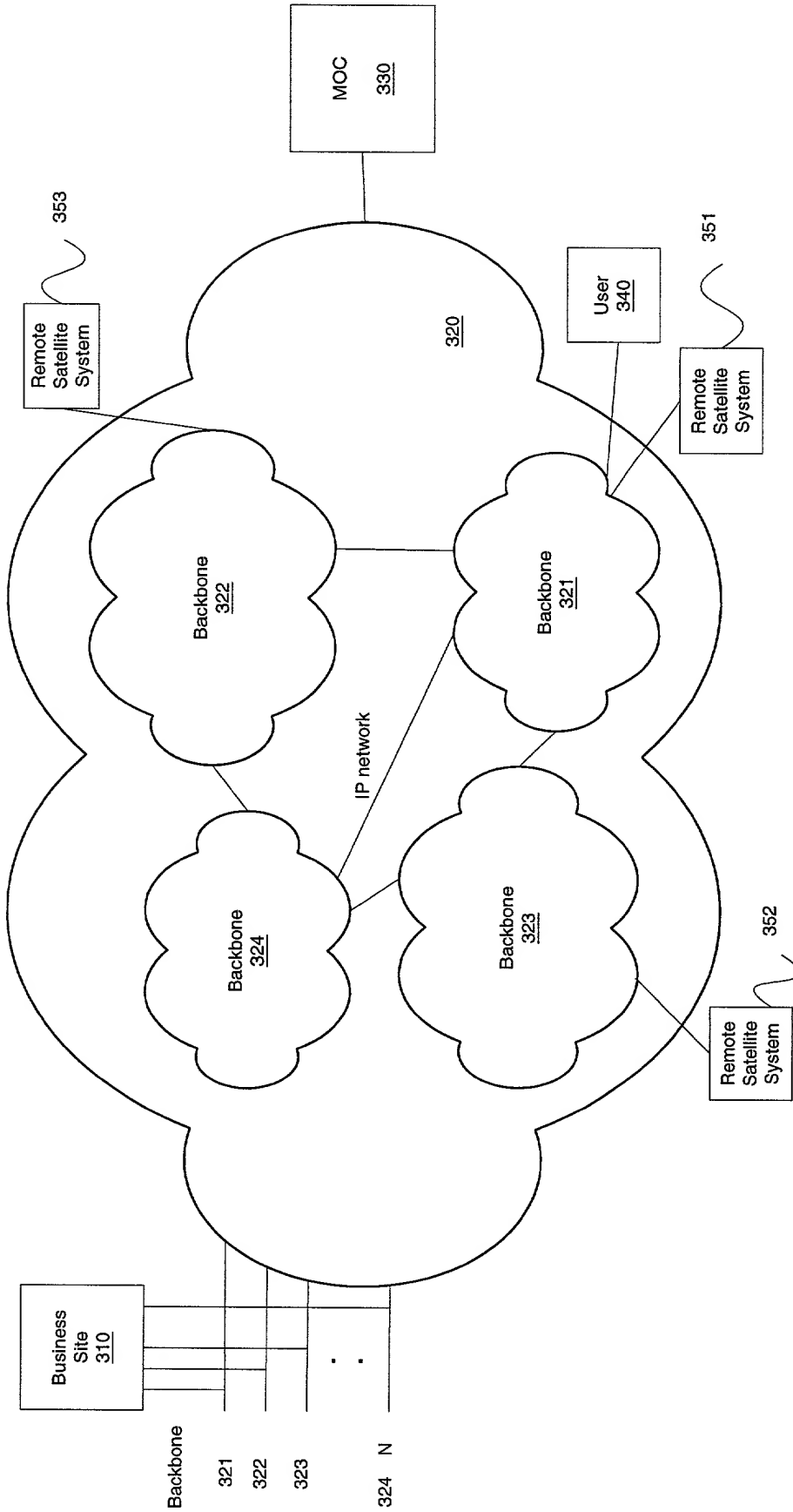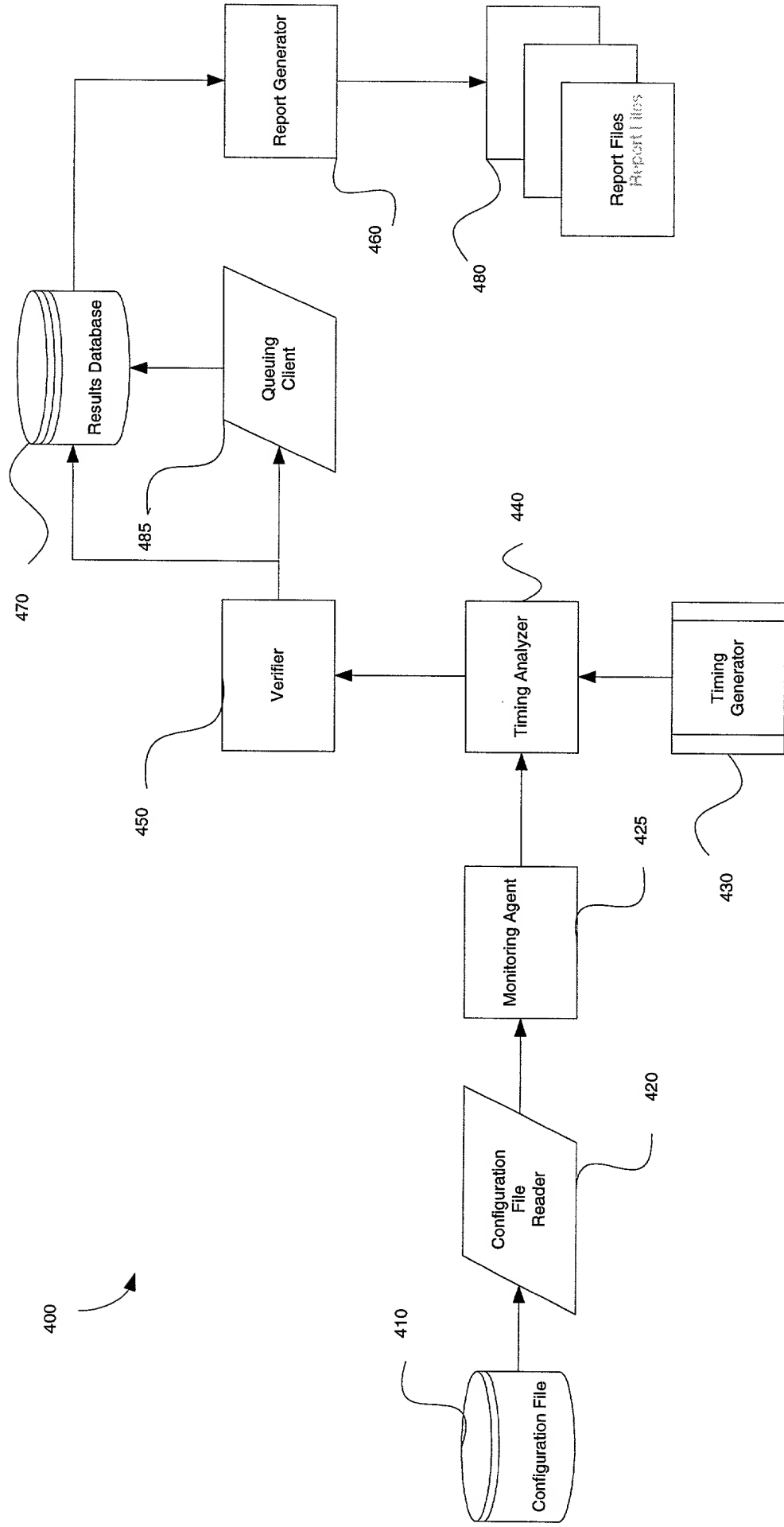
Figure 3

Figure 4

Digital Processing System

| Processor 502 | | System Memory 504 | | Mass Storage Device 507 |

Bus 501

| Display 521 | | Input Device 522 | | Cursor Control Device 523 |

| Network Interface 525 |

| Communication Device 526 |

500

Figure 5

Figure 6

Remote Monitoring Process

determine
monitoring
parameters     710

establish connection with
host     720

perform transaction     725

measure timing parameters

evaluate correctness
parameters     740

730

additional
transactions?     755

Y

N

additional
URLs?     750

Y

N

upload data     760

end
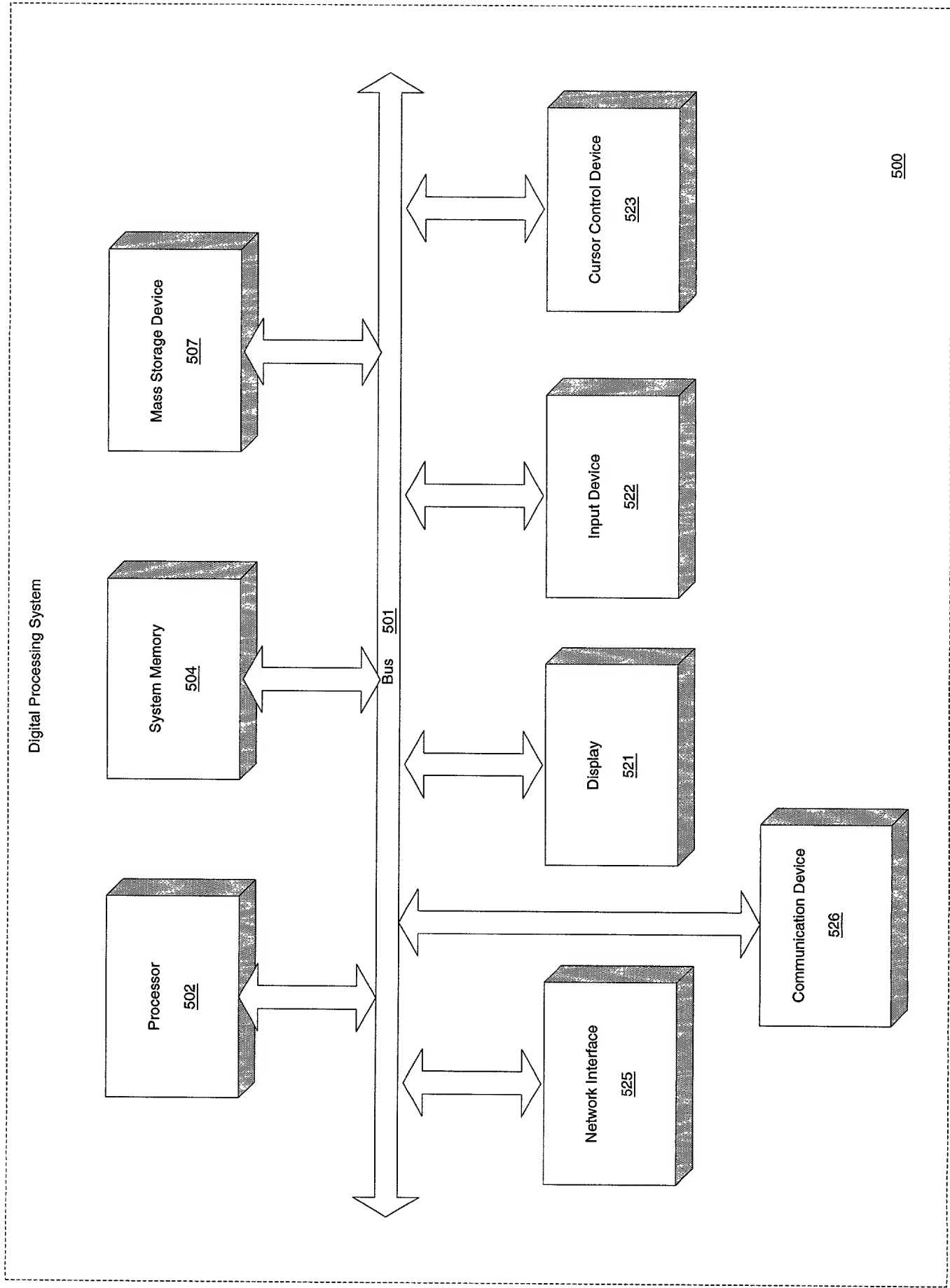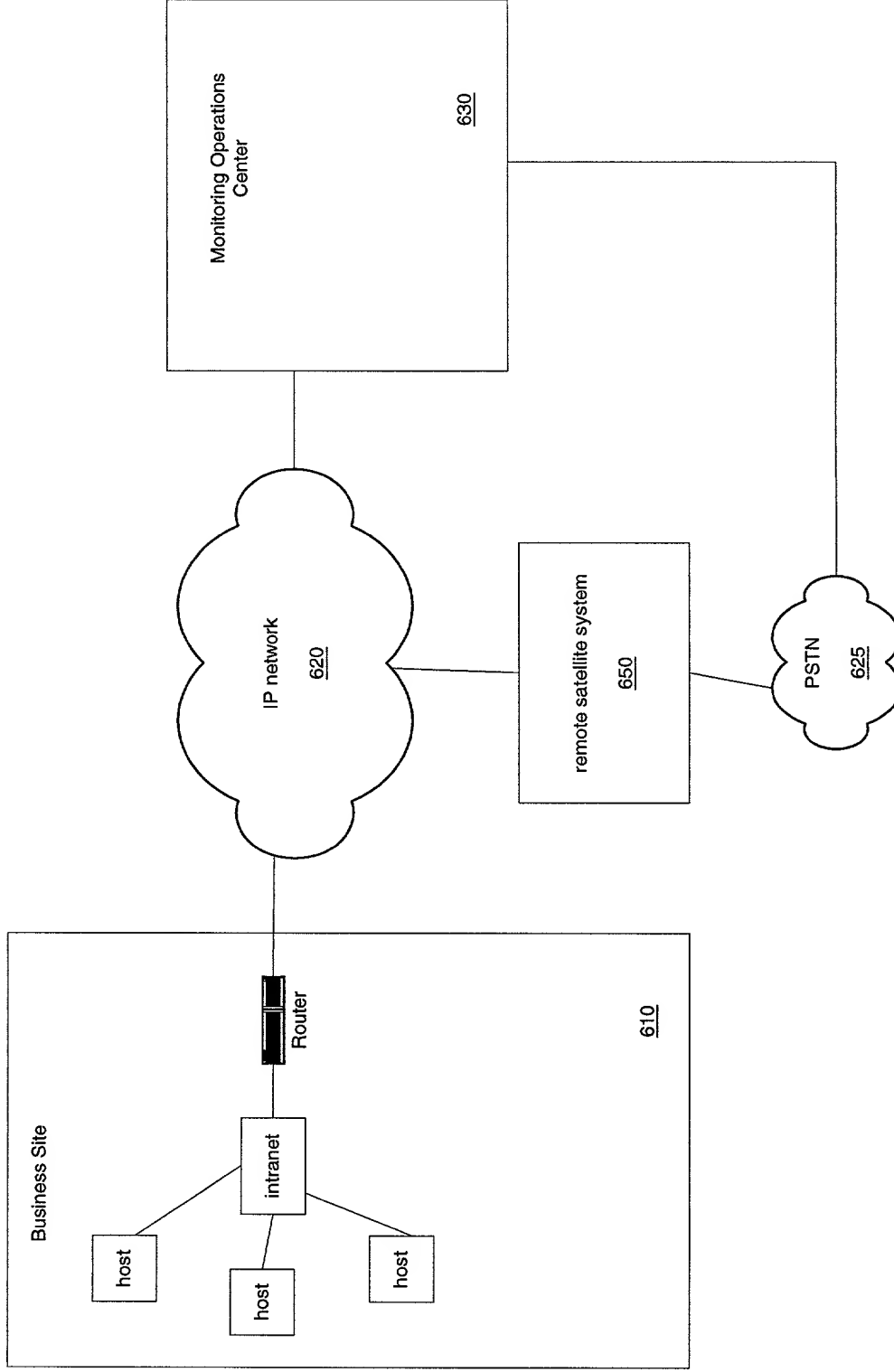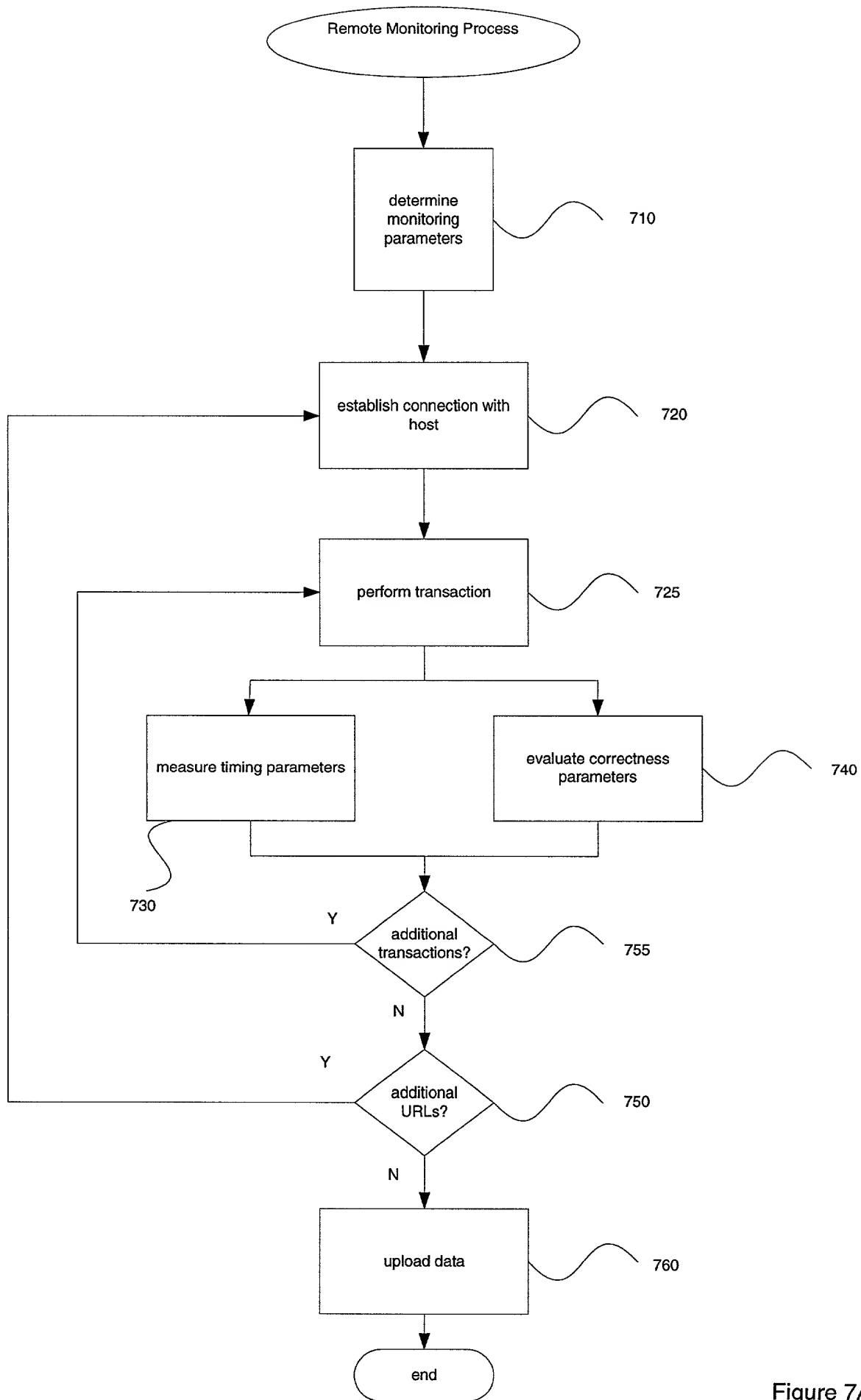
Figure 7A

**URL**

761 — Protocol [http: ▼]   host: [_____] [?] port: [_____]

Path: [/ _____]

Method  ◉ GET
        ○ POST content: [_____]

**Features:**

Subsidiary pages? ○ yes ◉ no    Link verification? ○ yes ◉ no    } 765

Content check [_____]

**Notifications**

on recovery? ○ yes ◉ no     when critical? ○ yes ◉ no     on warning? ○ yes ◉ no

**Thresholds**

763 —

Total time: critical (s): [_____] warning (s): [_____]

Latency: critical (s): [_____] warning (s): [_____]

Connect time: critical (s): [_____] warning (s): [_____]

DNS: critical (s): [_____] warning (s): [_____]

Throughput: critical (bps): [_____] warning (bps): [_____]

Trans: critical (bps): [_____] warning (bps): [_____]

764 —

Contact:
| All contacts | | Selected contacts |
| Steve_pager | [Add] | Tom_pager |
| Joe_pager | [Remove] | |
| DBA_group | | |
| Tom_email | | |
| Manager_email | | |
| Steve_methods | | |

**Advanced Options:**

762 — Authentication: username: [_____] password: [_____]

767 —

Set cookie:

key [_____] value: [_____]

path [_____] domain: [_____]

Cookie port [_____] Secure? ○ yes ○ no

FIGURE 7B

## Timing Parameter Measurement Process

start high resolution timer — 810

DNS lookup time ← perform DNS lookup and calculate lookup time — 815

connect time ← connect to server and calculate connect time — 820

Send request and record request time — 825

latency ← receive first byte of response and calculate latency — 830

receive last byte of data and recond total time — 835

calcualte aggregate timing parameters — 840

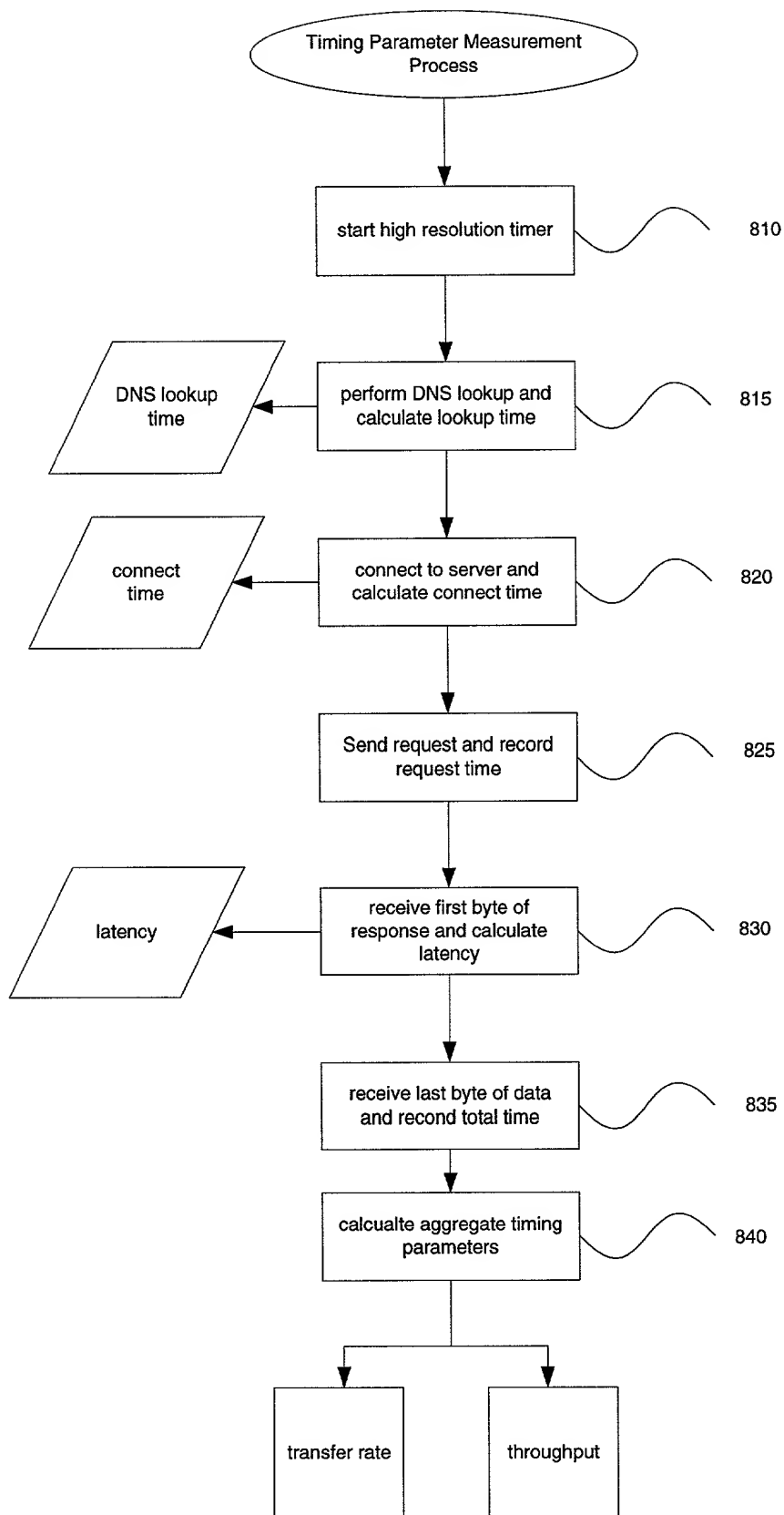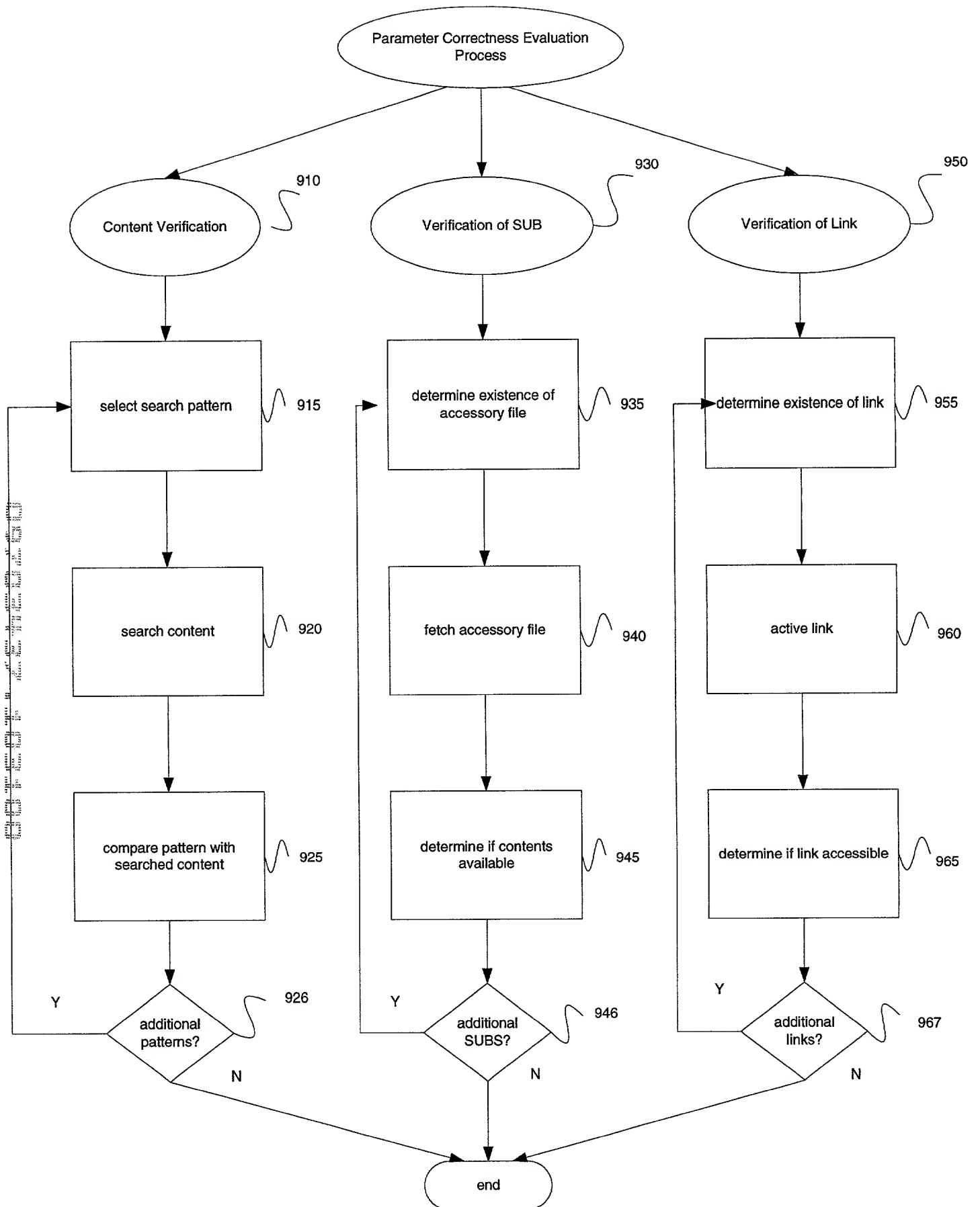transfer rate          throughput

Figure 8

Figure 9

## <u>DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION</u>

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
  Method Of And Apparatus For Remote Monitoring

the specification of which

     _X_     is attached hereto.
     ___     was filed on (MM/DD/YYYY) _____ as
                     United States Application Number _____
                     or PCT International Application Number _____
                     and was amended on (MM/DD/YYYY) _____.
                                               (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

| (Number) | (Country) | (Foreign Filing Date - MM/DD/YYYY) | Yes | No |
|---|---|---|---|---|
| (Number) | (Country) | (Foreign Filing Date - MM/DD/YYYY) | Yes | No |
| (Number) | (Country) | (Foreign Filing Date - MM/DD/YYYY) | Yes | No |

I hereby claim the benefit under title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below:

| (Application Number) | (Filing Date – MM/DD/YYYY) |
|---|---|
| (Application Number) | (Filing Date – MM/DD/YYYY) |

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

| (Application Number) | (Filing Date – MM/DD/YYYY) | (Status -- patented, pending, abandoned) |
|---|---|---|
| (Application Number) | (Filing Date – MM/DD/YYYY) | (Status -- patented, pending, abandoned) |

I hereby appoint the persons listed on Appendix A hereto (which is incorporated by reference and a part of this document) as my respective patent attorneys and patent agents, with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

**Send correspondence to __Daniel E. Ovanezian__, BLAKELY, SOKOLOFF, TAYLOR &**
**(Name of Attorney or Agent)**
**ZAFMAN LLP, 12400 Wilshire Boulevard 7th Floor, Los Angeles, California 90025 and direct**
**telephone calls to __Daniel E. Ovanezian__, (408) 720-8300.**
**(Name of Attorney or Agent)**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole/First Inventor __David D. Faraldo II__

Inventor's Signature __David D. Faraldo II__ Date __10/30/2000__

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Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City, State)                                    (Country)

Post Office Address _____

Full Name of Third/Joint Inventor _____

Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City, State)                                    (Country)

Post Office Address _____

Full Name of Fourth/Joint Inventor _____

Inventor's Signature _____ Date _____

Residence _____ Citizenship _____
(City, State)                                    (Country)

Post Office Address _____

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# APPENDIX A

William E. Alford, Reg. No. 37,764; Farzad E. Amini, Reg. No. 42,261; William Thomas Babbitt, Reg. No. 39,591; Carol F. Barry, Reg. No. 41,600; Jordan Michael Becker, Reg. No. 39,602; Lisa N. Benado, Reg. No. 39,995; Bradley J. Bereznak, Reg. No. 33,474; Michael A. Bernadicou, Reg. No. 35,934; Roger W. Blakely, Jr., Reg. No. 25,831; R. Alan Burnett, Reg. No. 46,149; Gregory D. Caldwell, Reg. No. 39,926; Andrew C. Chen, Reg. No. 43,544; Thomas M. Coester, Reg. No. 39,637; Donna Jo Coningsby, Reg. No. 41,684; Florin Corie, Reg. No. 46,244; Dennis M. deGuzman, Reg. No. 41,702; Stephen M. De Klerk, Reg. No. 46,503; Michael Anthony DeSanctis, Reg. No. 39,957; Daniel M. De Vos, Reg. No. 37,813; Sanjeet Dutta, Reg. No. 46,145; Matthew C. Fagan, Reg. No. 37,542; Tarek N. Fahmi, Reg. No. 41,402; George Fountain, Reg. No. 37,374; James Y. Go, Reg. No. 40,621; James A. Henry, Reg. No. 41,064; Libby N. Ho, Reg. No. 46,774; Willmore F. Holbrow III, Reg. No. 41,845; Sheryl Sue Holloway, Reg. No. 37,850; George W Hoover II, Reg. No. 32,992; Eric S. Hyman, Reg. No. 30,139; William W. Kidd, Reg. No. 31,772; Sang Hui Kim, Reg. No. 40,450; Walter T. Kim, Reg. No. 42,731; Eric T. King, Reg. No. 44,188; George Brian Leavell, Reg. No. 45,436; Kurt P. Leyendecker, Reg. No. 42,799; Gordon R. Lindeen III, Reg. No. 33,192; Jan Carol Little, Reg. No. 41,181; Robert G. Litts, Reg. No. 46,876; Joseph Lutz, Reg. No. 43,765; Michael J. Mallie, Reg. No. 36,591; Andre L. Marais, under 37 C.F.R. § 10.9(b); Paul A. Mendonsa, Reg. No. 42,879; Clive D. Menezes, Reg. No. 45,493; Chun M. Ng, Reg. No. 36,878; Thien T. Nguyen, Reg. No. 43,835; Thinh V. Nguyen, Reg. No. 42,034; Dennis A. Nicholls, Reg. No. 42,036; Robert B. O'Rourke, Reg. No. 46,972; Daniel E. Ovanezian, Reg. No. 41,236; Kenneth B. Paley, Reg. No. 38,989; Gregg A. Peacock, Reg. No. 45,001; Marina Portnova, Reg. No. 45,750; William F. Ryann, Reg. 44,313; James H. Salter, Reg. No. 35,668; William W. Schaal, Reg. No. 39,018; James C. Scheller, Reg. No. 31,195; Jeffrey Sam Smith, Reg. No. 39,377; Maria McCormack Sobrino, Reg. No. 31,639; Stanley W. Sokoloff, Reg. No. 25,128; Judith A. Szepesi, Reg. No. 39,393; Vincent P. Tassinari, Reg. No. 42,179; Edwin H. Taylor, Reg. No. 25,129; John F. Travis, Reg. No. 43,203; Joseph A. Twarowski, Reg. No. 42,191; Tom Van Zandt, Reg. No. 43,219; Lester J. Vincent, Reg. No. 31,460; Glenn E. Von Tersch, Reg. No. 41,364; John Patrick Ward, Reg. No. 40,216; Mark L. Watson, Reg. No. 46,322; Thomas C. Webster, Reg. No. 46,154; and Norman Zafman, Reg. No. 26,250; my patent attorneys, and Firasat Ali, Reg. No. 45,715; Justin M. Dillon, Reg. No. 42,486; Thomas S. Ferrill, Reg. No. 42,532; and Raul Martinez, Reg. No. 46,904, my patent agents, of BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP, with offices located at 12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025, telephone (310) 207-3800, and James R. Thein, Reg. No. 31,710, my patent attorney with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

# APPENDIX B

### Title 37, Code of Federal Regulations, Section 1.56
### Duty to Disclose Information Material to Patentability

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclosure information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclosure all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

    (1)    Prior art cited in search reports of a foreign patent office in a counterpart application, and

    (2)    The closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

    (b)    Under this section, information is material to patentability when it is not cumulative to information already of record or being made or record in the application, and

    (1)    It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

    (2)    It refutes, or is inconsistent with, a position the applicant takes in:

    (i)    Opposing an argument of unpatentability relied on by the Office, or

    (ii)    Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

    (c)    Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

    (1)    Each inventor named in the application;

    (2)    Each attorney or agent who prepares or prosecutes the application; and

    (3)    Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

    (d)    Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.

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